

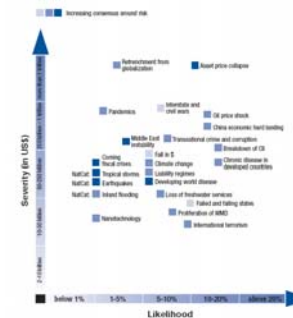
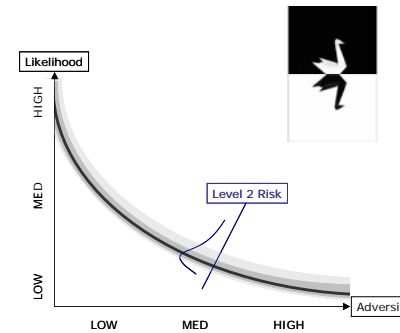
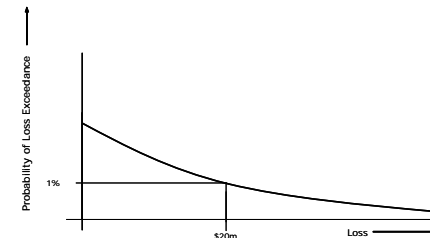
What is Risk?

There are more things in heaven and
earth, Horatio,
Than are dreamt of in your philosophy.

William Shakespeare, Hamlet

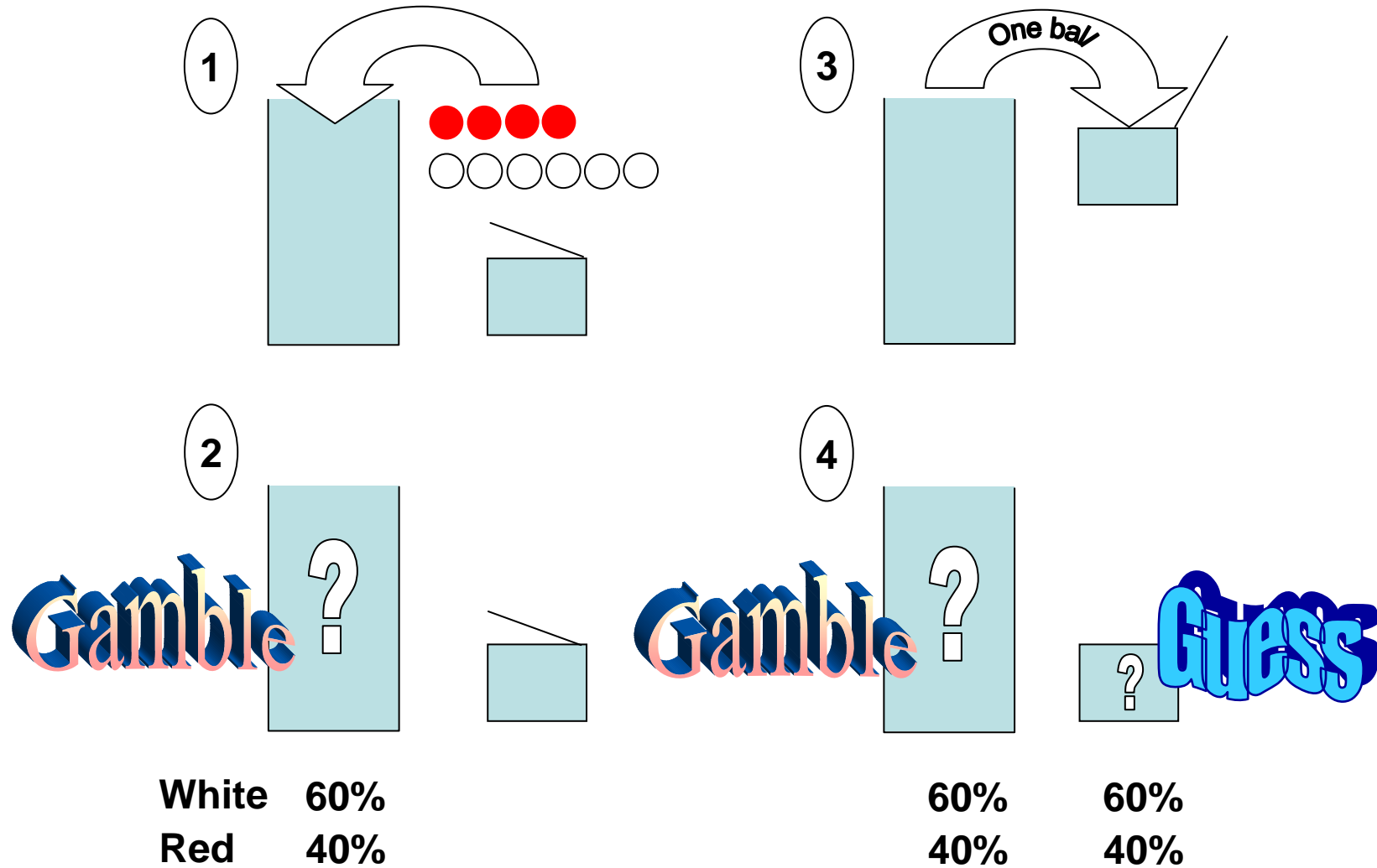
Risk

- Loss x Chance
- Not a number, but a curve
- Not just a single curve
- Not necessarily quantitative



Types of Uncertainty

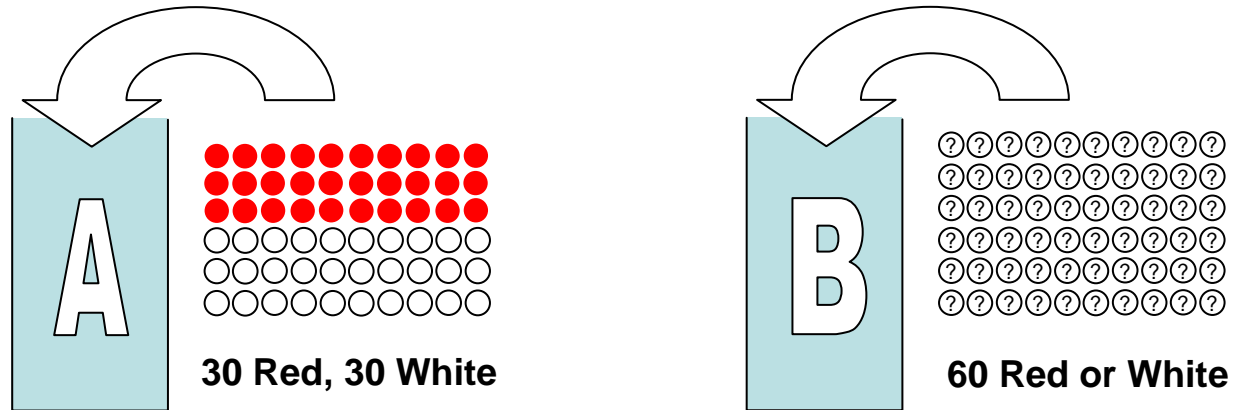
Intrinsic & Knowledge Uncertainty



Intrinsic & Knowledge Uncertainty

- Intrinsic Uncertainty
 - Like a game of chance (2) – we can make a choice from a space of possibilities
- Knowledge Uncertainty
 - From lack of knowledge (4) – there is only one ball, we just don't know which one
 - In the absence of any other information assume same as the intrinsic gamble
- Yet we do not view these two types of uncertainty with the same confidence ...

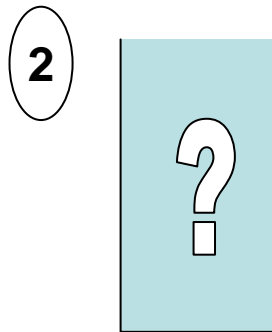
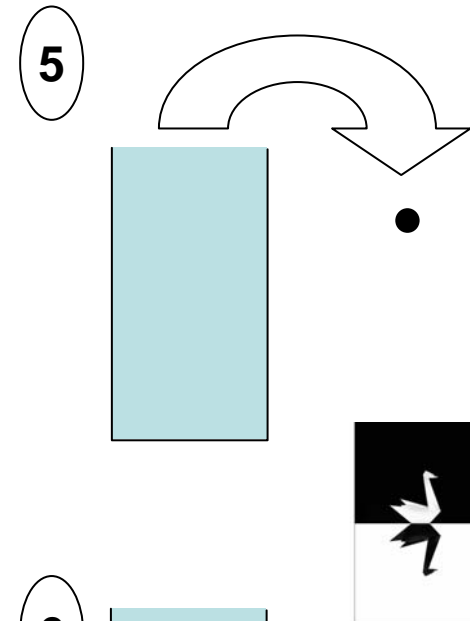
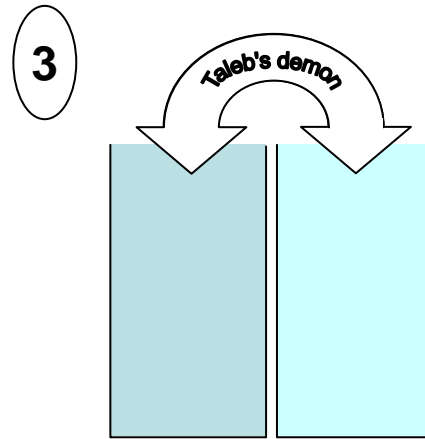
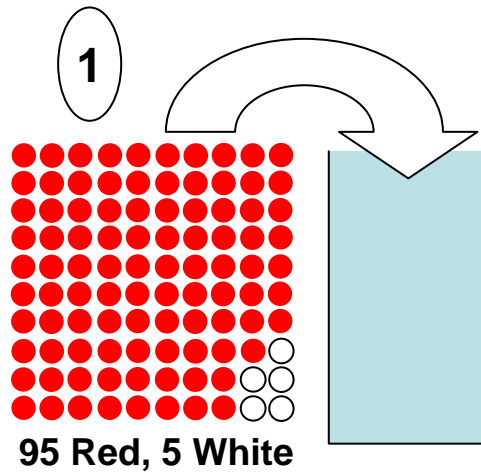
Ellsberg Paradox



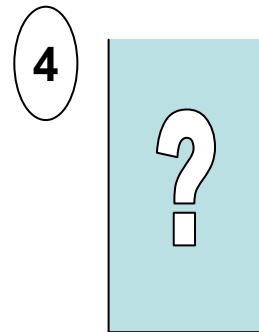
You win £100 if you pick a white ball				You win £100 if you pick a red ball			
Urn A		Urn B		Urn A		Urn B	
Winnings	Choice	Winnings	Choice	Winnings	Choice	Winnings	Choice
£100	50%	£100	?%	-	50%	-	?%
-	50%	-	100-?%	£100	50%	£100	100-?%

People mostly choose the Urn with the **intrinsic** not **knowledge** risk
 Even switching colour, still choose the intrinsic (alaetory) Urn !

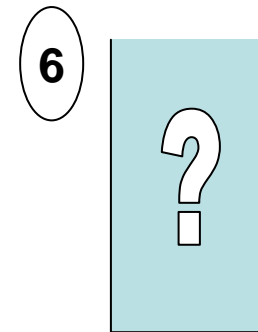
Talebian Uncertainty



White 5%
Red 95%



Odds of a
white?



Odds of a
black?

Taleb's demon

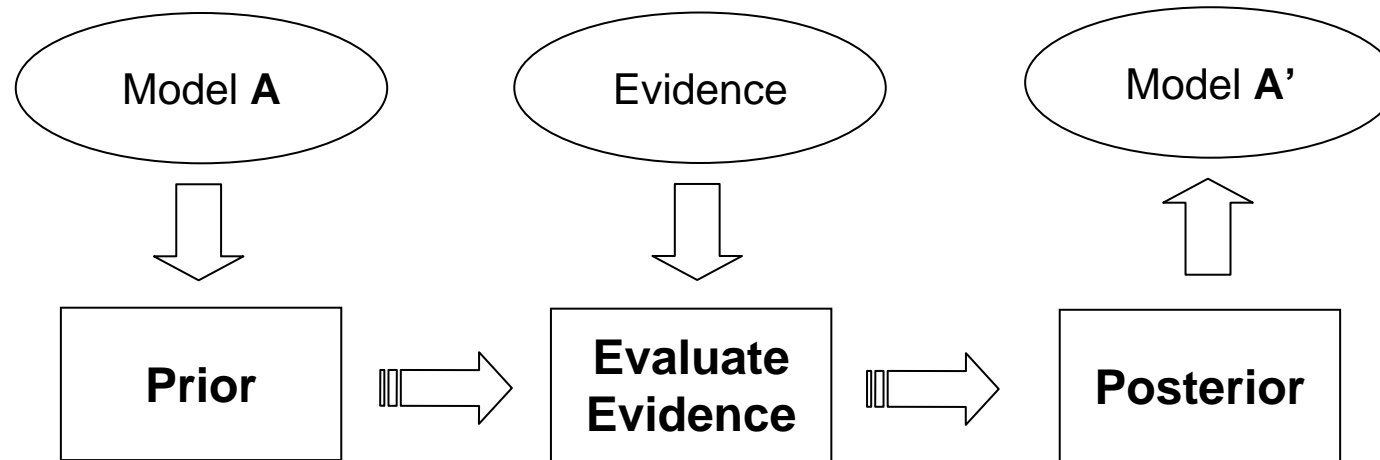
- Initially we have Intrinsic Uncertainty
 - Usual probability theory applicable (2)
- A demon can change the balls
 - We no longer know the space of possibilities (3 & 4)
 - But the principle of indifference would leave the odds the same if there were no new balls introduced or balls taken away
- Then we discover a black ball
 - We know something we didn't know but not what has happened to the space of possibilities (5 & 6)

The Jargon of Uncertainty

Intrinsic	Aleatory / Type A / Stochastic / Natural Variability / Irreducible	Parameter	Model
Knowledge	Epistemic / Type B / Subjective / Reducible		
Talebian	Knightian	?	

TaleBayesian

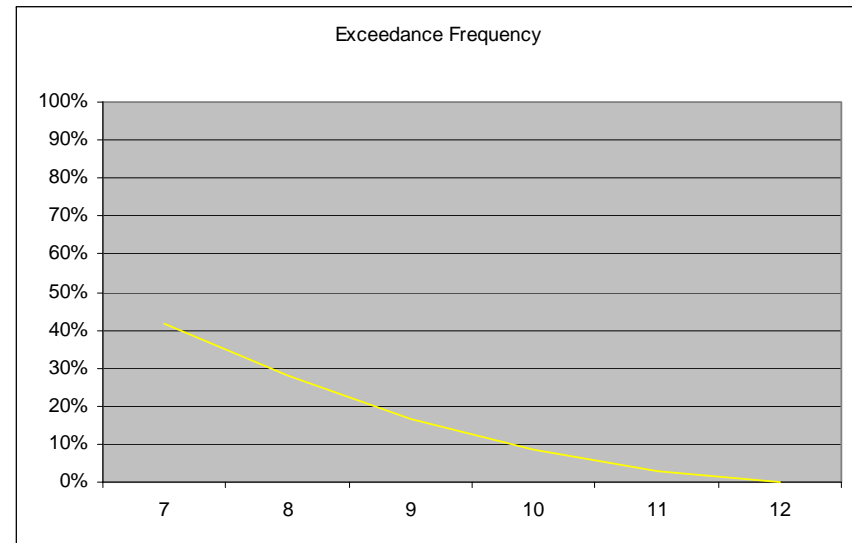
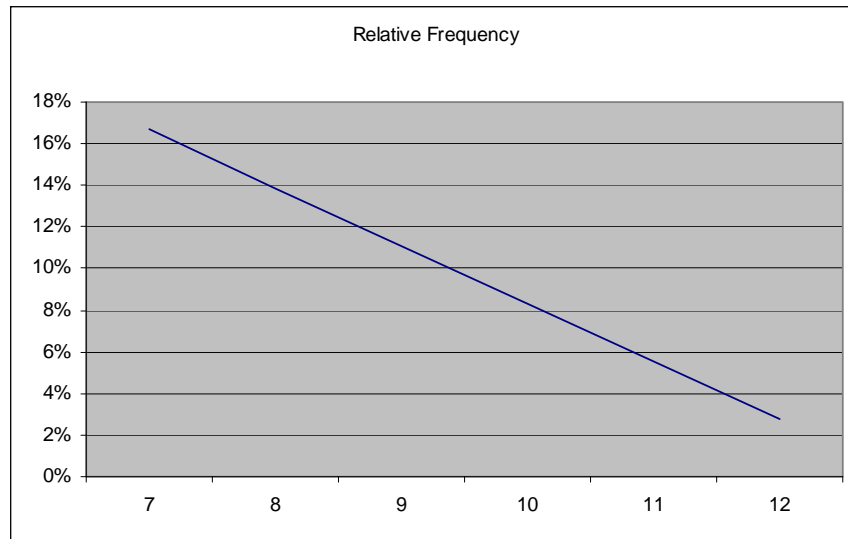
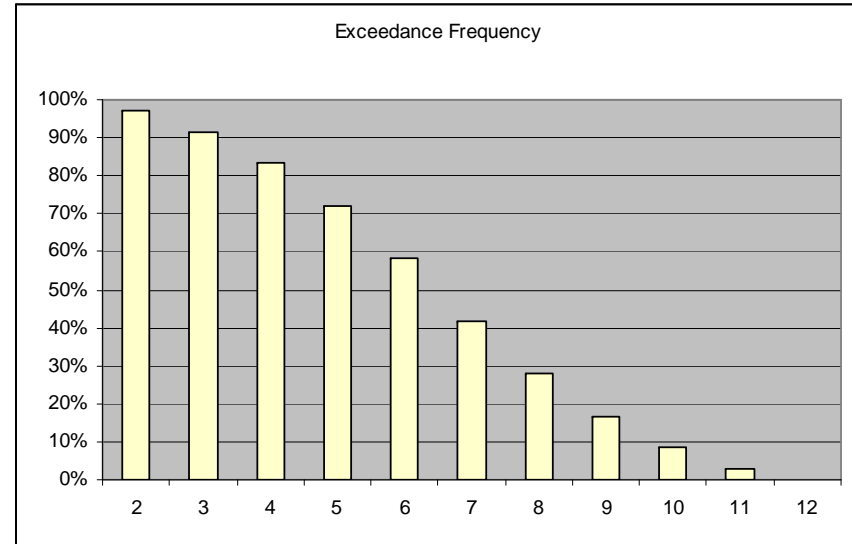
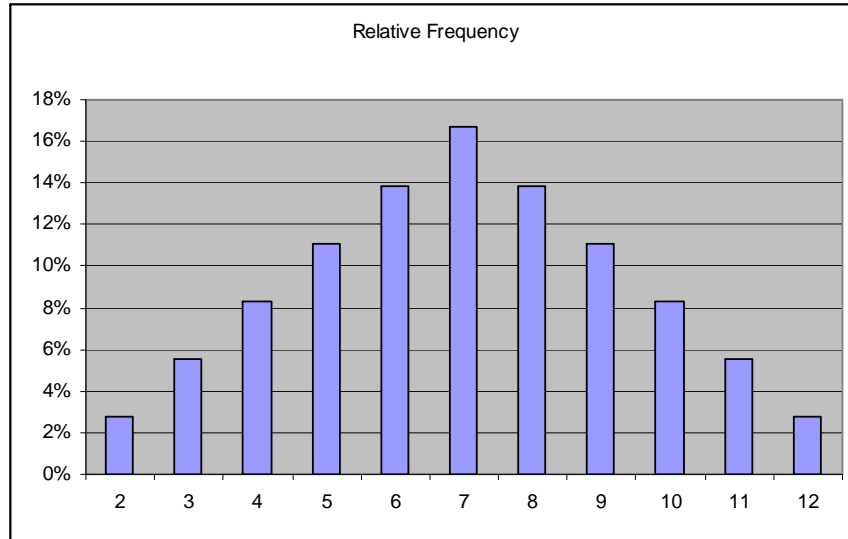
Re-consider the Model and Space of Possibilities
as well as the probabilities or parameters



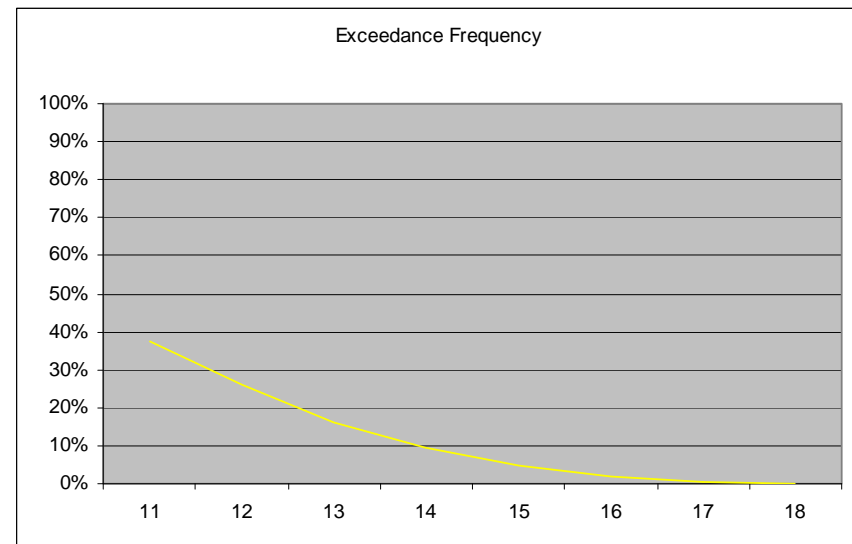
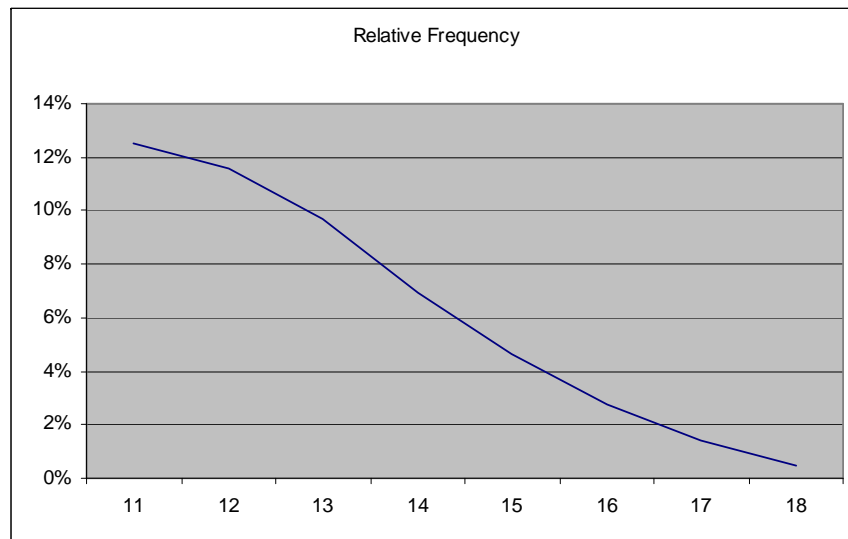
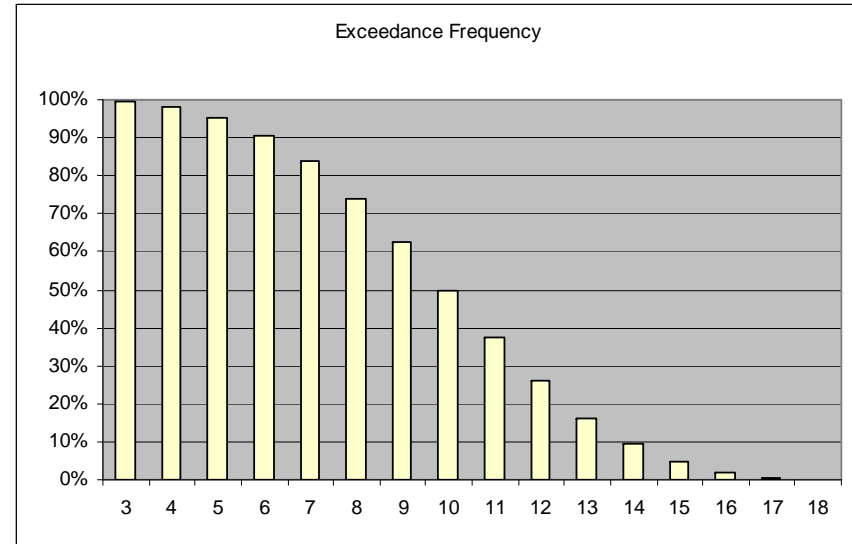
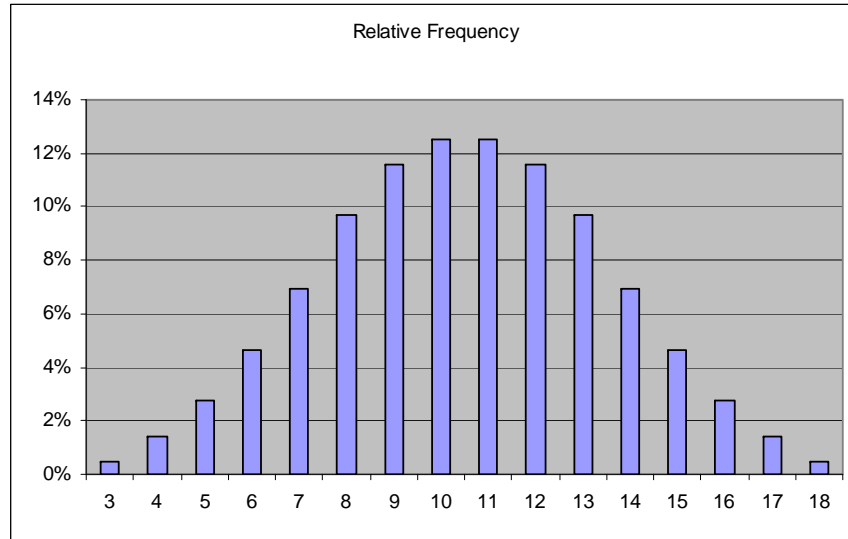
- Probabilities
- Parameters
- **The Model**
- **The Space of Possibilities**

Loss Curves

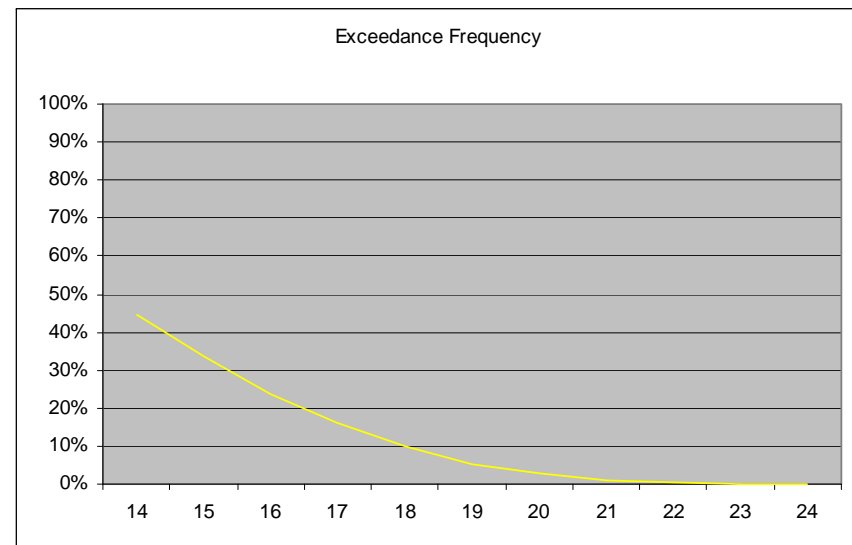
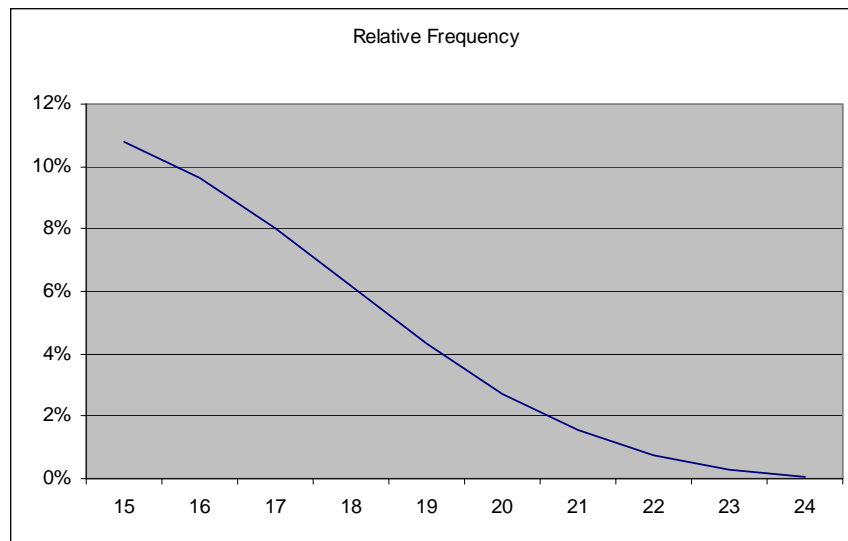
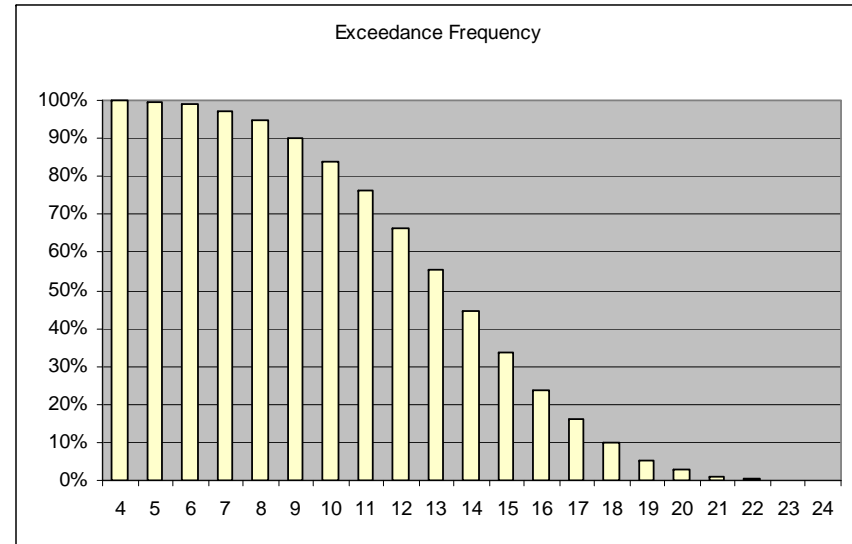
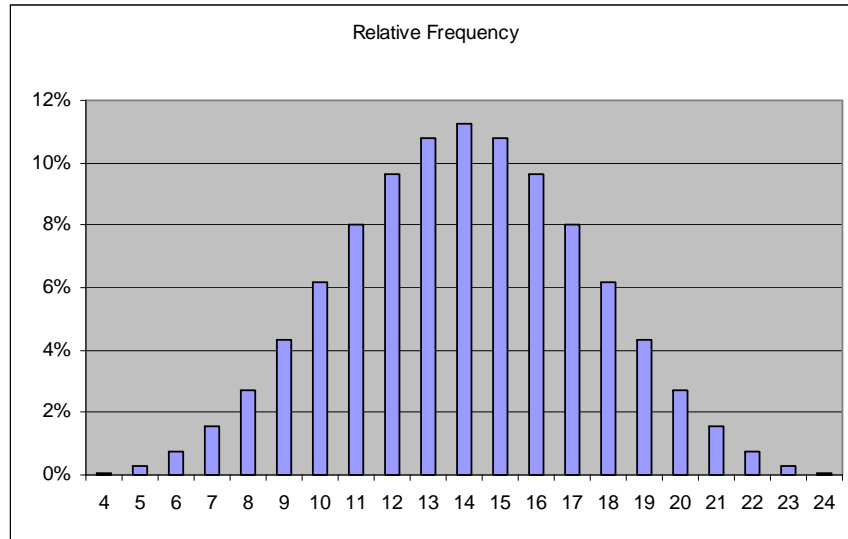
Two Dice



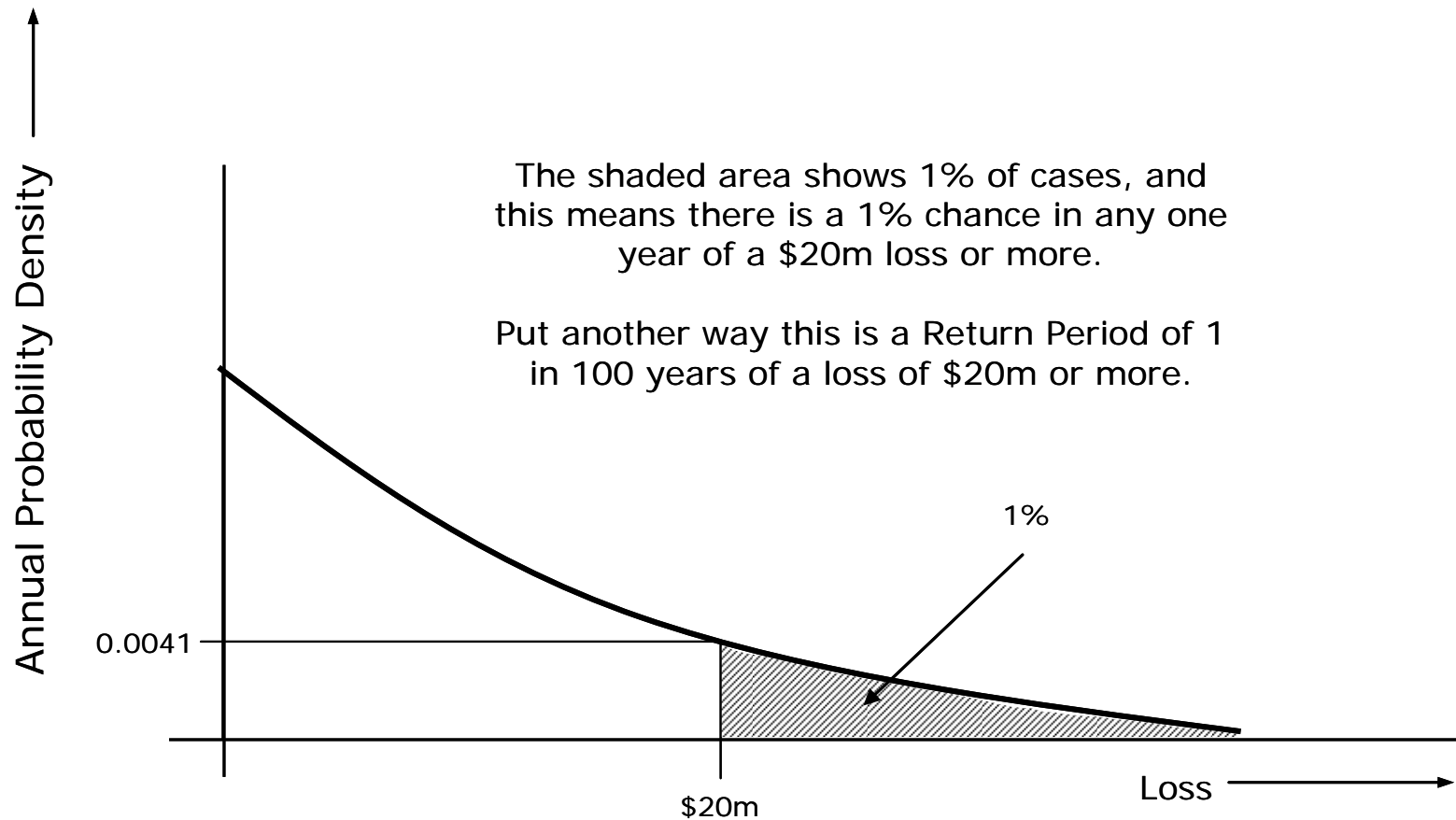
Three Dice



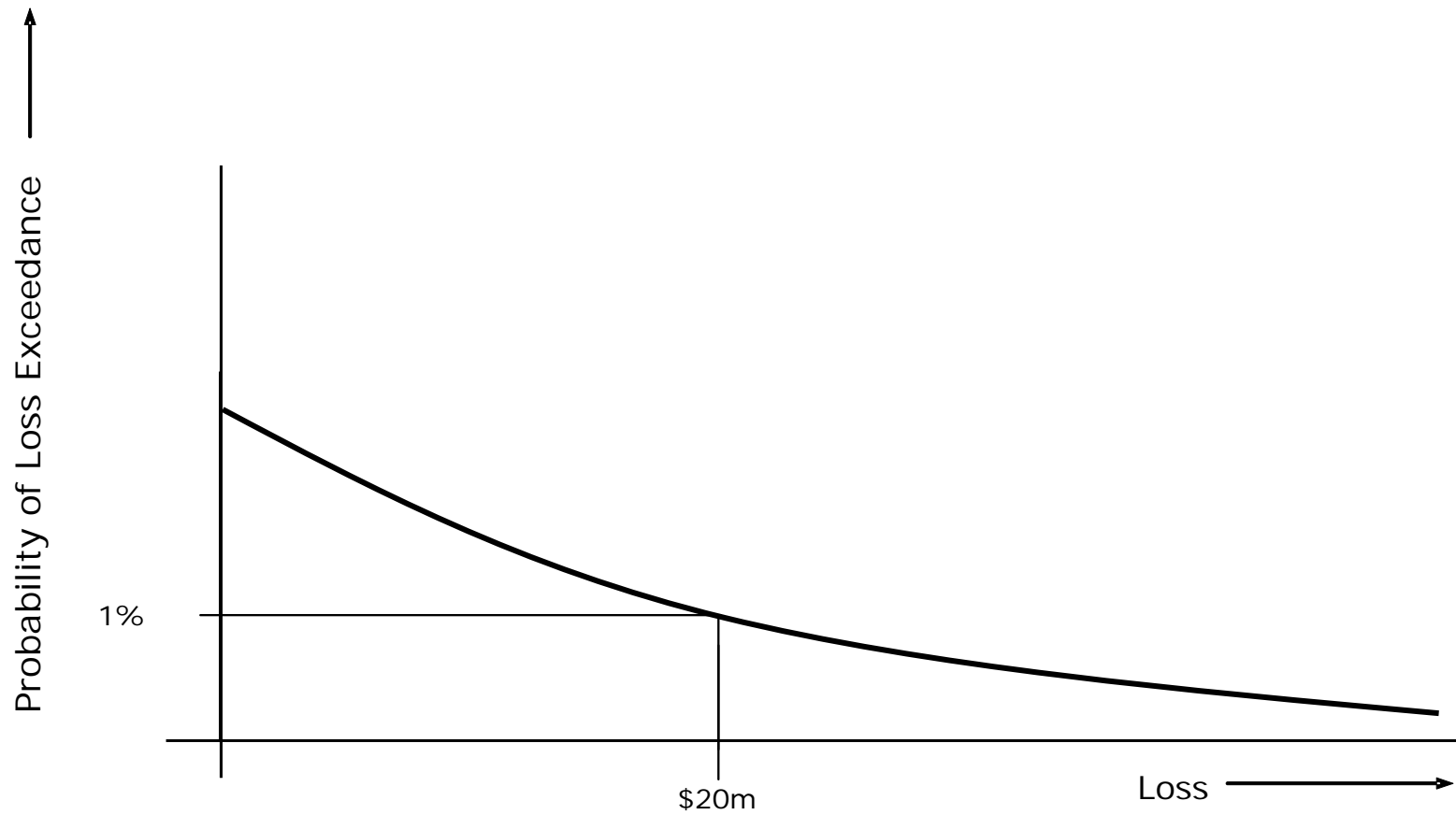
Four Dice



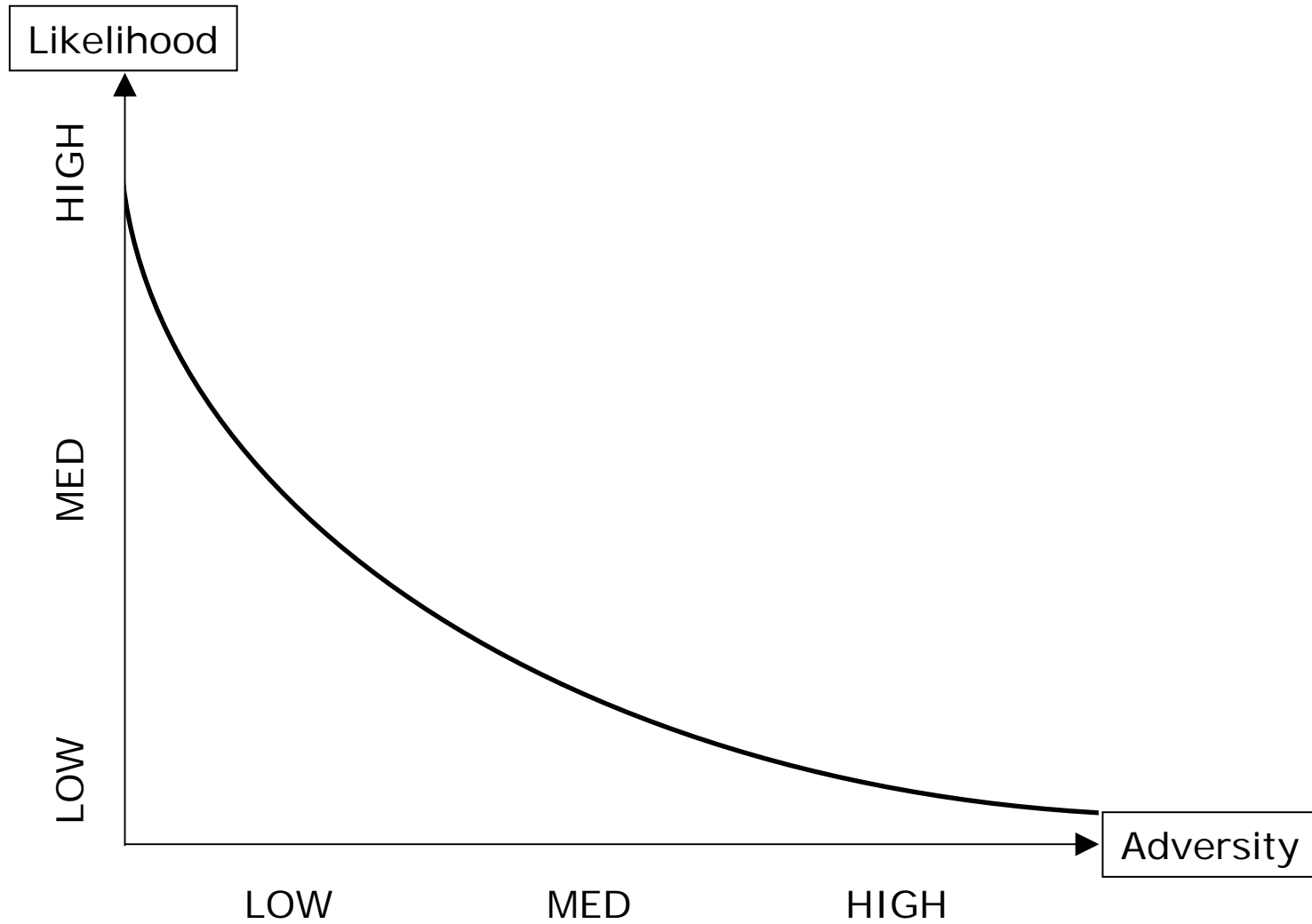
Loss Probability Curve



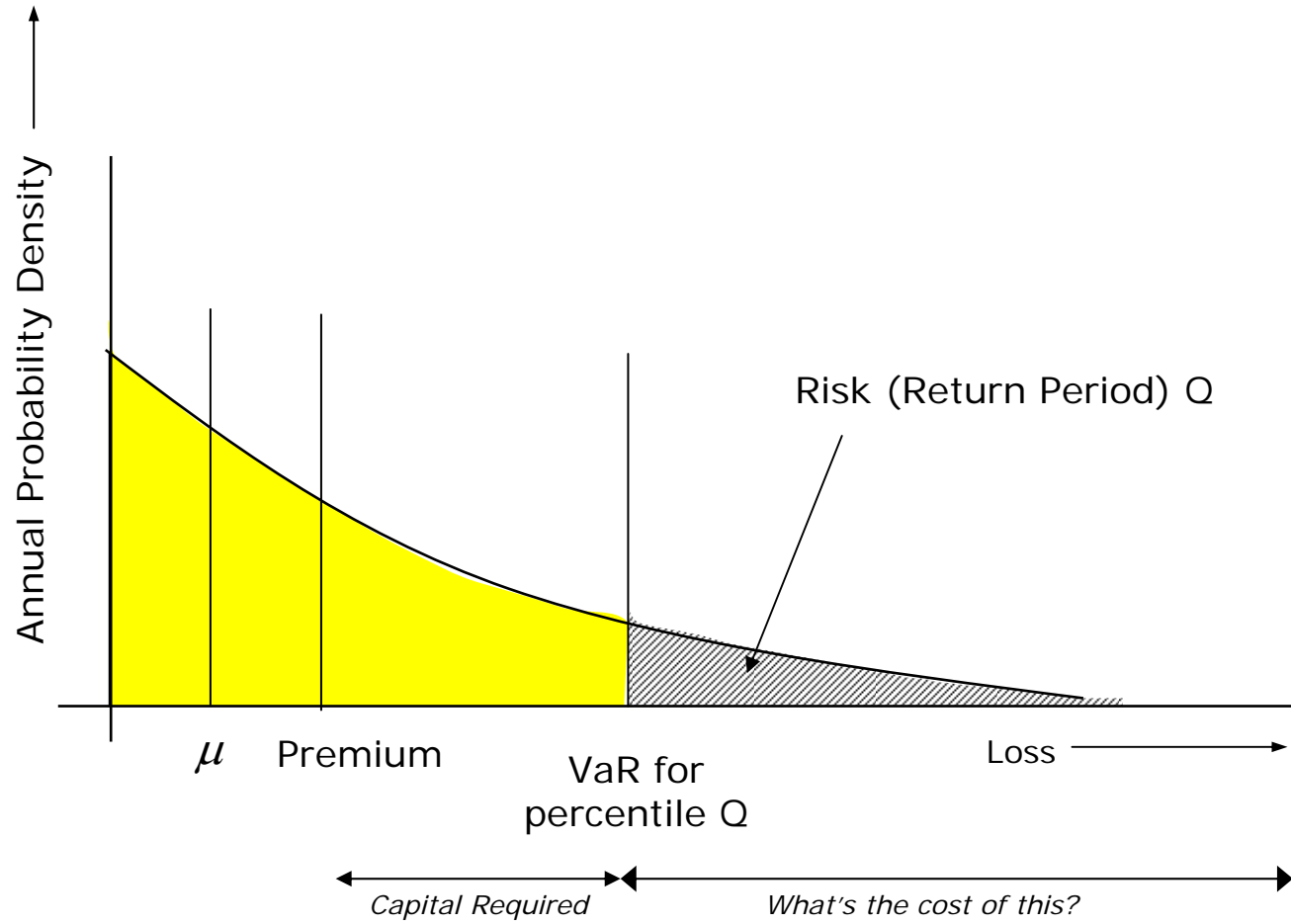
Exceedance Probability (EP) Curve



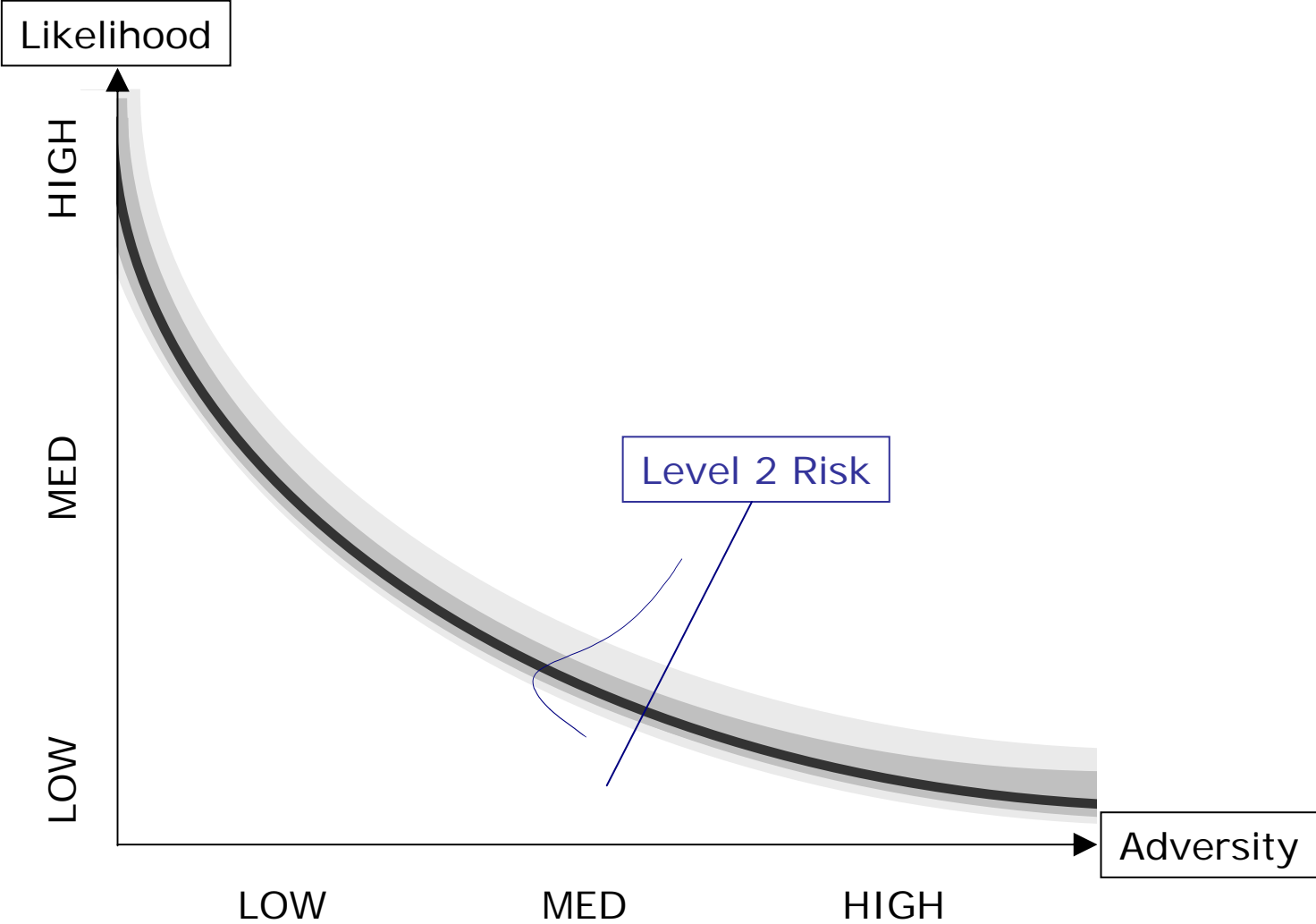
A Risk Curve!



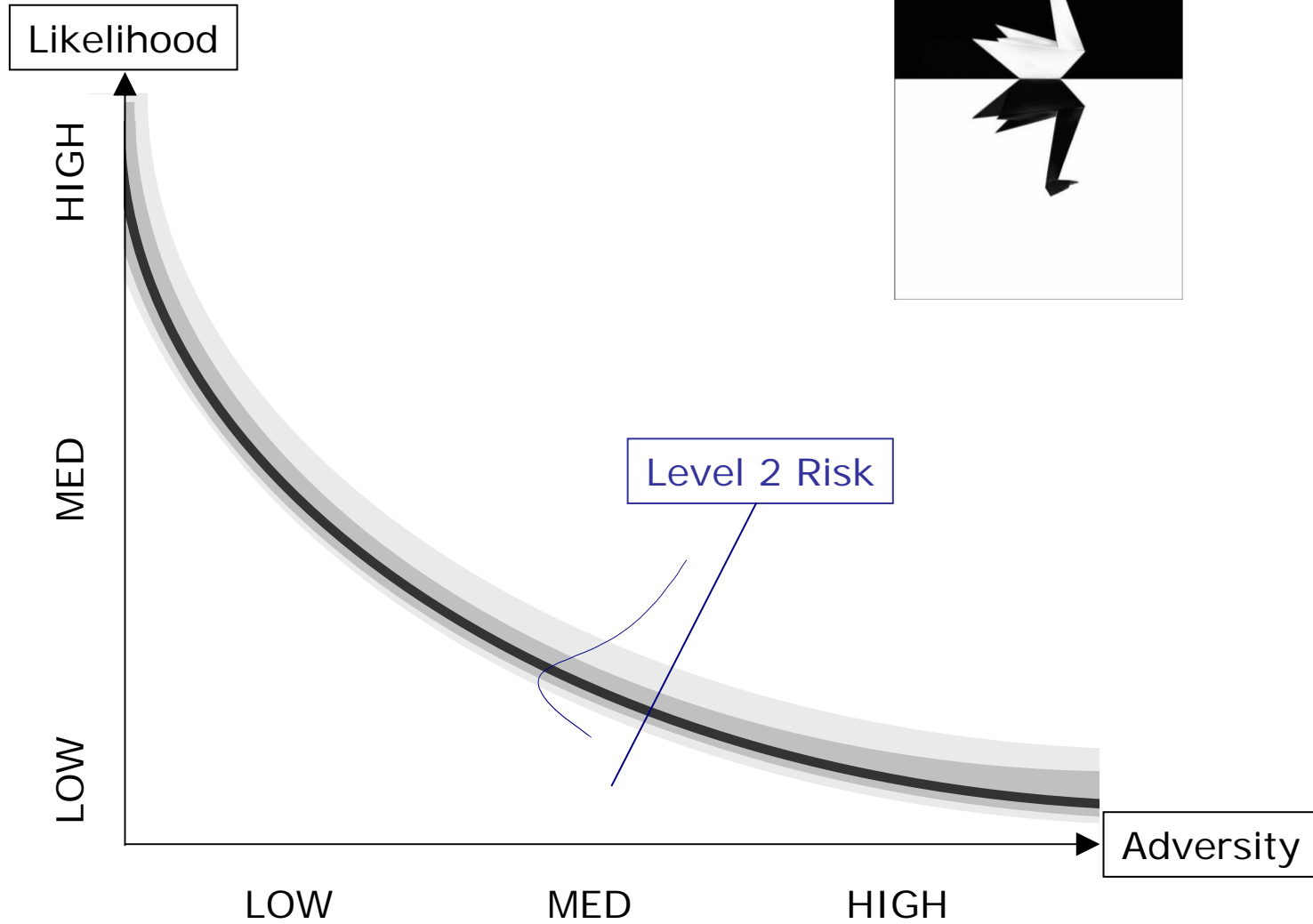
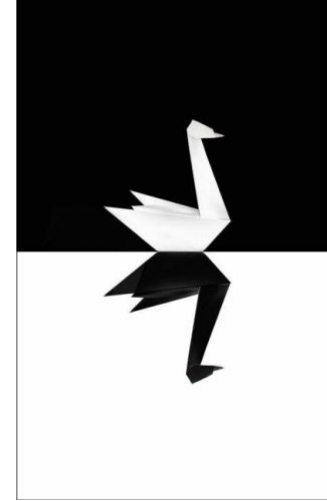
EP Curve



Full Risk Curve

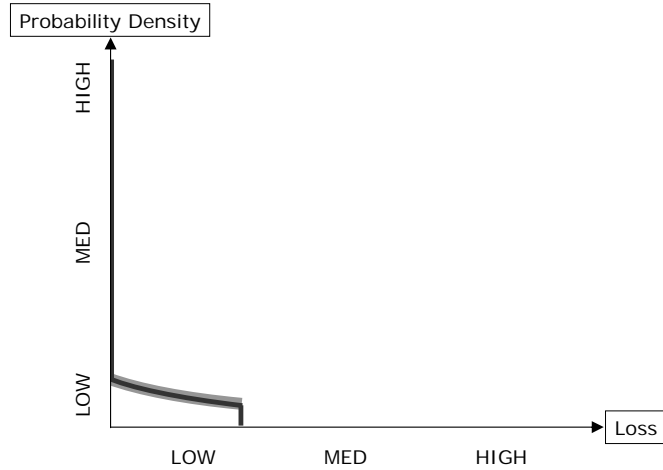


Plus

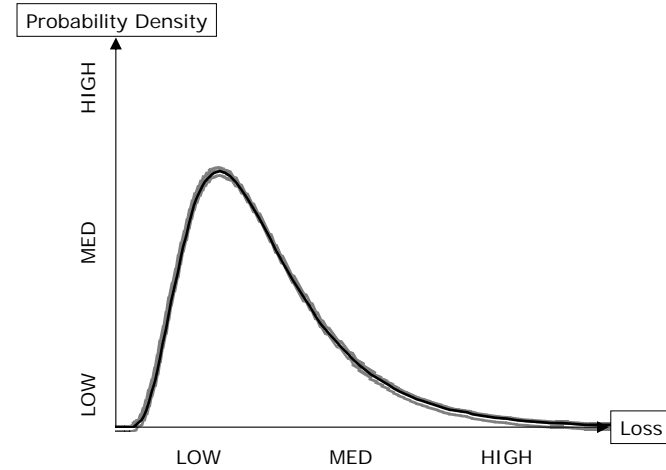


Risk Curves

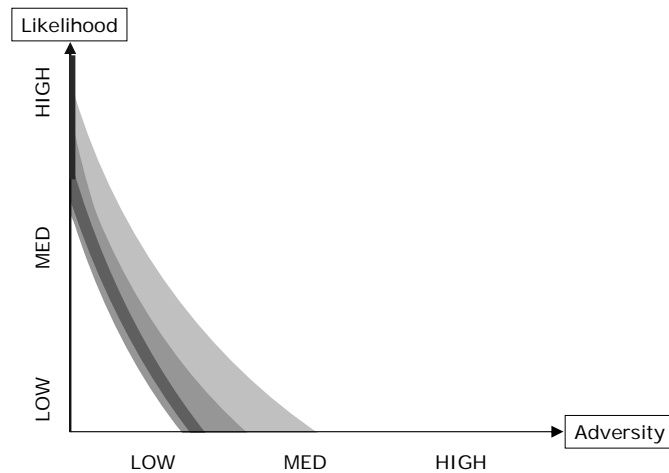
Example 1 – Property Fire Risk



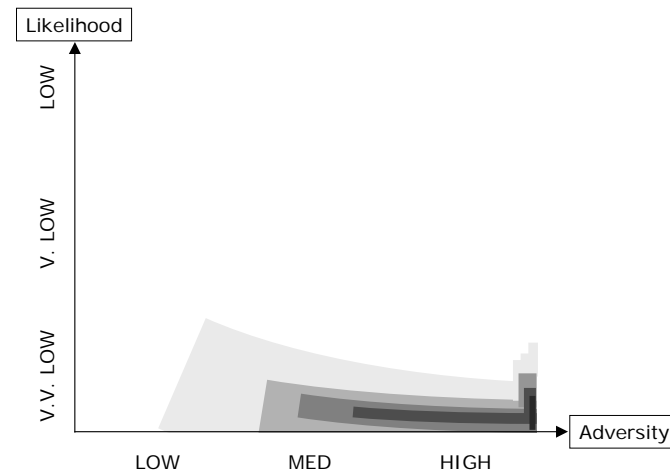
Example 2 – Insurance Portfolio



Example 3 – Catch Cold this Year

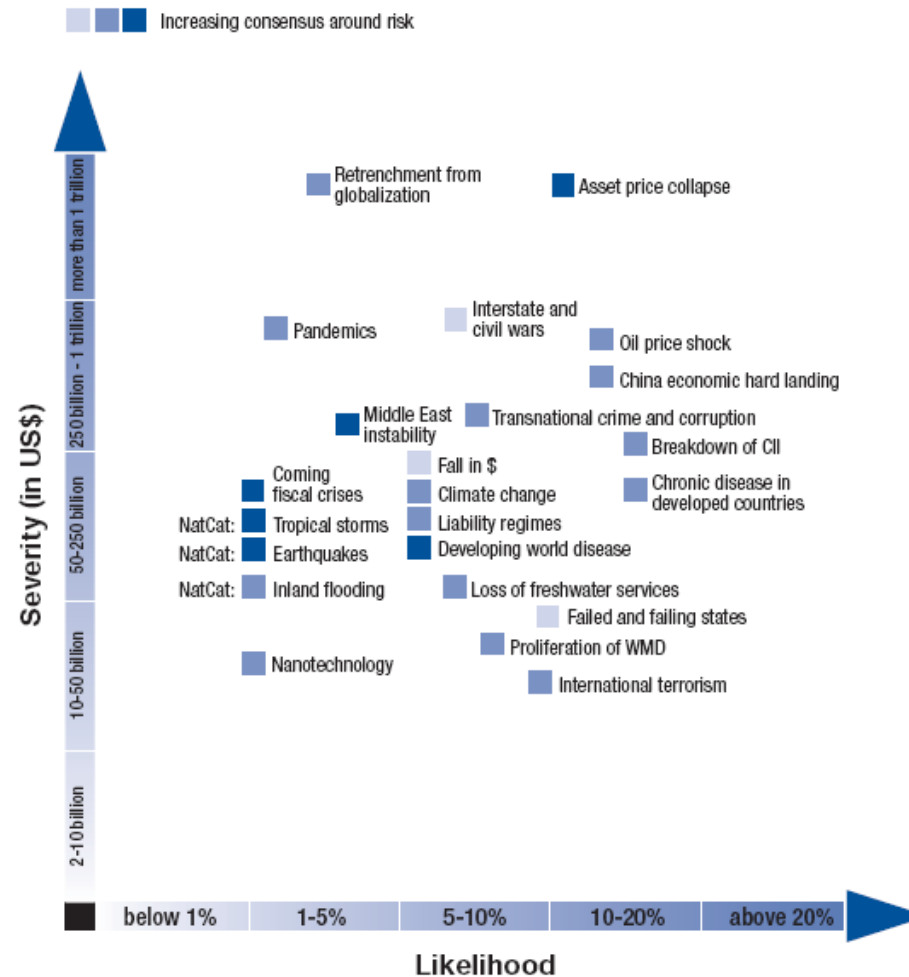


Example 4 – Run Over this Year



Top 23 Global Risks 2007

By economic loss



Source: World Economic Forum Global Risks 2007 report

Risk Map

Impact	Risk Distribution		
Significant	S2 • E2 •	E1 • L3 • T1 •	T2 • TF1 •
Moderate		T3 • F3 • S3 • L2 •	
Minor	L1 • F2 •	S1 •	E3 •
	Low	Medium	High
	Likelihood		

<p>Economic and Financial F1 Interest rate F2 Securities F3 Cost of insurance</p> <p>Environmental E1 Climate change E2 Pollution E3 Ozone depletion</p> <p>Legal L1 Liabilities L2 Human rights L3 International agreements</p> <p>Technological T1 Nuclear power T2 Biotechnology T3 Genetic engineering</p> <p>Safety and Security S1 Invasion S2 Terrorism S3 Organized crime</p>

Source: Integrated Risk Management, Treasury Board of Canada

Our challenge is to represent the full range of uncertainty.

When we can quantify that then we are charging a fair price for the risks we are bearing.